

## PATENT ABSTRACTS OF JAPAN

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(71)Applicant : MATSUSHITA ELECTRIC IND CO LTD

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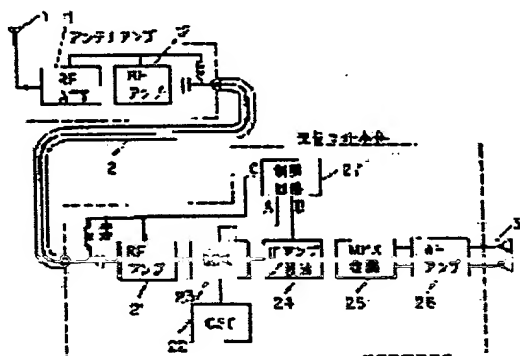
(72)Inventor : ORIKABE NORIO  
NAKAYAMA KIYOSHI

## (54) ON-VEHICLE FM RECEPTION SYSTEM DEVICE

## (57)Abstract:

PURPOSE: To obtain the on-vehicle FM reception system which can execute satisfactory FM reception even at a place where there are a lot of FM stations or TV stations and field intensity is strong.

CONSTITUTION: An output A detected as a voltage to be changed corresponding to an input signal at a MIX 23 for detecting the field intensity in a wide band including jamming signals and an output B obtained by an IF amplifier/detection part 24 for detecting the field in a narrow band including desired signals are inputted to a control circuit 27. According to an arbitrary logic output composed of these two values, a control output C to generate an optimum mixed modulating output is supplied as an AGC input and an RF attenuator control input on the side of an antenna amplifier, and a satisfactory receiving characteristic can be obtained without using the AGC operation of the own inside closed loop.



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(71) 出願人 000005821  
松下電器産業株式会社  
大阪府門真市大字門真1006番地

(72) 発明者 織壁 則夫  
神奈川県横浜市港北区綱島東四丁目3番1  
号 松下通信工業株式会社内

(72) 発明者 中山 喜世志  
神奈川県横浜市港北区綱島東四丁目3番1  
号 松下通信工業株式会社内

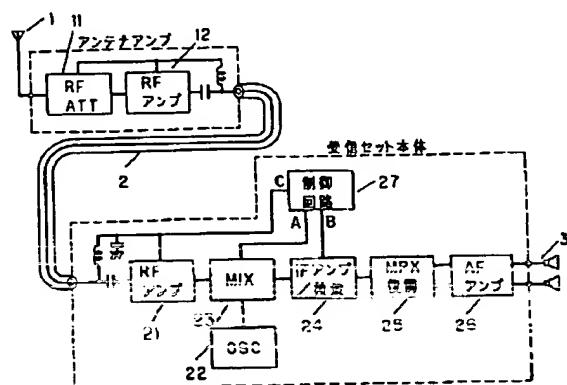
(74) 代理人 弁理士 小鍛冶 明 (外2名)

(54) 【発明の名称】 車載用FM受信システム装置

(57) 【要約】

【目的】 FM局やTV局が多く、電界強度の強い場所においても、良好なFM受信が可能な車載用FM受信システム装置を提供する。

【構成】 妨害信号を含む広帯域での電界強度を検出するため、MIX 5 において入力信号に応じて変化する電圧として検出された出力Aと、希望信号を含む狭帯域での電界強度を検出するため、1 F アンプ/検波部 6 により得られる出力Bとが、制御回路 10 に入力される。この二つの信号からなる、任意の強弱出力によって、最速の混変調出力を生ずる制御出力Cを、アンテナアンプ側のAGC入力及びRFアッテネータ制御入力として供給して、自らの内部制御ループのAGC作用を使うことがなく、良好な受信特性が得られる。



## 【特許請求の範囲】

【請求項1】 比較的広帯域で電界強度を検出するRF-AGC出力回路と、比較的狭帯域で電界強度を検出するIF-AGC出力回路と、このIF-AGC出力回路と前記RF-AGC出力回路との2つの出力値からなる、任意の論理出力による混変調出力を最小せしめる制御回路と備え、この制御回路からの制御出力を芯線に重畳し、それにより制御される高周波増幅器と減衰器とを有して、外部制御線を有しない車載用アンテナアンプと受信セットからなる車載用受信システム装置。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】 本発明は車載用FM受信装置に関し、FM、TV局が多く、相互変調、混変調の起こりやすい強電界地区において、良好な受信状態を保つFM受信装置に関するものである。

## 【0002】

【従来の技術】 図7は従来のアンテナアンプと受信セット本体との結合を示している。従来図8に示すように、この種のアンテナアンプ装置は、自らAGC装置を備えておらず、本体側にてAGC制御をするが、非常に大きな強入力妨害信号が入った場合は制御不能となった。また、図9に示す如く、自らAGC装置を備えているものでは、ある程度の強入力制御はできる。

## 【0003】

【発明が解決しようとする課題】 しかしながら、上記従来のアンテナアンプ装置では、RFアンプ12に内蔵されているAGC装置が、中心周波数より広帯域の所に強入力妨害信号がある場合、リニアに動作してしまい、更に希望信号が弱い場合は、その信号レベルが低下し、実用上判別し難い信号対雑音比となり、良好な受信ができないという問題があった。

【0004】 本発明はこのような従来の問題を解決するものであり、電界強度の強い場所についても良好なFM受信が可能となる優れた車載用FM受信システム装置を提供するものである。

## 【0005】

【課題を解決するための手段】 本発明は上記目的を達成するために、受信セット本体側に設置されている、比較的広帯域で電界強度を検出するRF-AGC出力回路と、比較的狭帯域で電界強度を検出するIF-AGC出力回路との2つの入力値からなる、任意の論理出力によって、最適な混変調出力を生ずる制御出力を、アンテナアンプ側のAGC入力、及び、RFアッテネータ制御入力として、供給するようにしたものである。

## 【0006】

【作用】 従って、本発明によれば、受信セット本体側の最適混変調せしめる制御出力が利用でき、アンテナアンプの内部閉ループのAGC作用を使うことがなく、良好な受信特性が得られる。

## 【0007】

【実施例】 図1に本発明に係わる受信セット本体側のブロックダイアグラムを示す。アンテナアンプからの増幅された入力RF（高周波）信号は、例えばデュアルゲートFET構成のRFアンプ21で増幅され、OSC（局部発信）部22からの出力とMIX（混合）部23で、混合され、IF（中間周波）信号に変換される。しかる後リミッタ機能を有するIFアンプ/検波部24へ入力され、例えばクワドラチャ検波等により、コンボジット信号に変換されて後、MPX（マルチプレックス）復調回路25へ加えられて、左右チャンネルへ分離される。この左右チャンネル信号は、AF（オーディオ周波数）信号アンプ部26を介し、電力増幅され、外部スピーカ31を駆動し、音声出力とする。

【0008】 さて、広帯域（一般に妨害信号も含まれる）の電界強度を検出するべく、MIX部23で入力RF信号レベルに応じて変化する電圧として検出された出力Aは、アンテナアンプ内のRFアッテネータ部11や、RFアンプ部12の信号を制御するための制御回路部27に輸入される。他方、狭帯域（一般に希望信号のみ）の電界強度レベルを検出するべく、IFアンプ/検波部24のIF信号レベルが、内部の増幅部をAM検波することにより、得られる出力Bとして、同様に制御回路部27に輸入される。2つの入力A、Bを加えられた制御回路部27では、これらのレベルをもとに、相互変調、混変調特性に対し最適な電圧を判断し、アンテナアンプ内部のRF-ATT部11及びRFアンプ部12に対して、制御する出力Cを送出する。

【0009】 次に制御回路の動作について、詳細に説明する。図2は、希望信号入力電圧に対する、A及びB出力の特性である。図3は、希望信号入力電圧が十分（例えば、110dBμV程度）加わるようにした場合に、その入力電圧の周波数を、受信中心周波数より、ずらして行った場合の、広帯域レベルとしてのAと、狭帯域レベルとしてのBの電界強度レベル検出力特性を示したものである。

【0010】 図4は、図1の制御回路27の希望信号入力電界強度に対する、制御出力Cの特性である。例えば、狭帯域と広帯域AGCの変化領域の中間点を60dBμVとすると、Bが60dBμV以下を示し、Aが60dBμV以上を示した場合、妨害レベル入力有りと同断し、Cの出力特性をアナログ的に破綻のように変化させる論理機能を有する。（例はAが90dBμV入力時）図5は、同様に制御回路27による、アンテナ、フィード2を介して、アンテナアンプ内蔵のRFアッテネータ11の駆動出力特性を示す。例えば、80dBμV以上の出力に対し5.5V以下となるので、この電圧から、アンテナアンプ内蔵のアッテネータ11が動作し、過大な入力を防ぐ。

【0011】 図6に本発明に基づくアンテナアンプの実

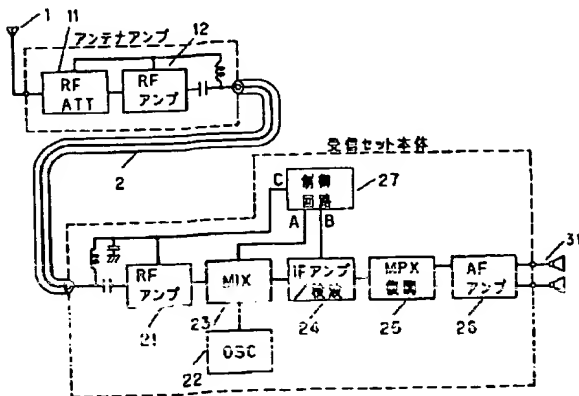
施例を示す。アンテナ1からの入力信号は、ピンダイオードD<sub>1</sub>スイッチングトランジスタQ<sub>1</sub>からなるRFアッテネータを通して、高周波増幅FET Q<sub>2</sub>に入り増幅された後、3の端子へ出力する。なお、4は電源端子、Q<sub>3</sub>・Q<sub>4</sub>はAM部の増幅トランジスタである。5は受信セット本体との結合ケーブルである。本発明による実施例としては、図1の受信セット本体の制御回路27のC出力が結合ケーブル5を介して、図6の出力端子3に繋がることにより、Q<sub>1</sub>のゲートがONしてD<sub>1</sub>が導通して強入力信号を減衰させる。また、Q<sub>2</sub>の第2ゲートが制御されるので、最も良い混変調特性を得ることができる。

【0012】更に、受信セット本体との結合ケーブルを、制御ケーブルとして利用しているので、新たな線の追加が無く、車両ハーネス組み付け時の難しさを増加させることもなく、省線化の効果が得られる。

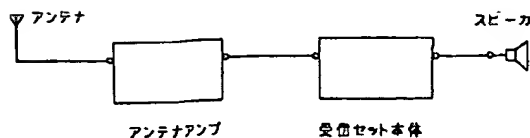
【0013】

【発明の効果】本発明は上記実施例より明らかなように、希望信号電界強度と妨害信号電界強度の大小に応じて、常に最適にアンテナアンプ内RFアッテネータ量、内部増幅利得、受信セット内RFアンプ利得を連続的に制御できるので、従来のアンテナアンプ内の独立したAGC制御と受信セット本体の組み合わせに比べて、混変調、相互変調妨害を受けにくくなり、FM局やTV局が多く、電界強度の強い場所についても、良好なFM受信が可能となる。

【図1】



【図7】



【0014】また、受信セット本体との結合ケーブルを利用して、アンテナアンプの制御をしているので、省線化の効果も大である。

【図面の簡単な説明】

【図1】本発明の一実施例における車載用FM受信システム装置のブロック図

【図2】同装置の希望信号入力電圧対広帯域、狭帯域制御出力特性

【図3】同装置の希望信号中心周波数からの偏移対広帯域、狭帯域制御出力電圧特性

【図4】同装置の希望信号入力電圧対妨害信号入力電圧をパラメータにした時のRFアンプ制御出力特性

【図5】同装置のRF-ATT制御特性

【図6】同装置のアンテナアンプの一実施例

【図7】従来のアンテナアンプと受信セット本体の結合図

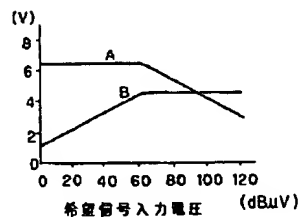
【図8】従来のアンテナアンプの回路図

【図9】従来のアンテナアンプのAGC内蔵型回路図

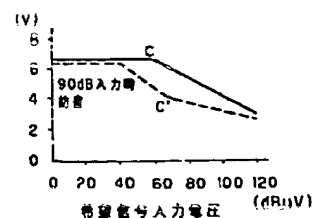
【符号の説明】

- 11 FR-ATT (アッテネータ) 部
- 12 FRアンプ部
- 21 FRアンプ
- 22 OSC (局部発信) 部
- 23 MIX (混合) 部
- 24 IFアンプ/検波部
- 27 制御回路

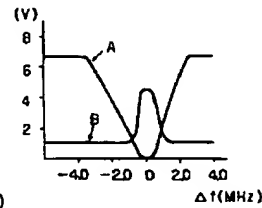
【図2】



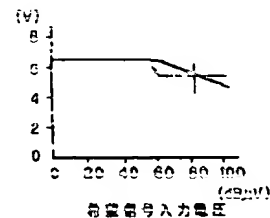
【図4】



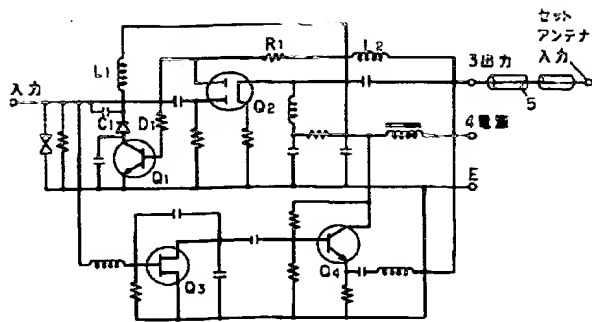
【図3】



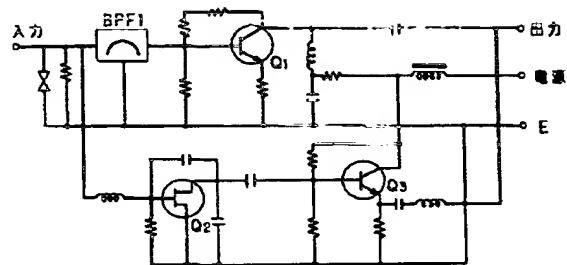
【図5】



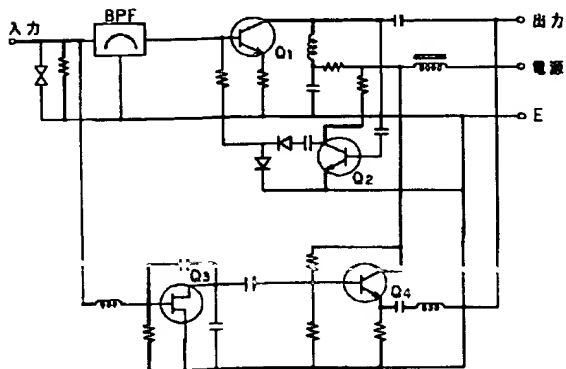
【図6】



【図8】



【図9】



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1. This document has been translated by computer. So the translation may not reflect the original precisely.
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CLAIMS

[Claim(s)]

[Claim 1] The RF-AGC output circuit which detects field strength comparatively in a broadband, and the IF-AGC output circuit which detects field strength comparatively in a narrow-band, Consist of two output values of this IF-AGC output circuit and said RF-AGC output circuit. The receiving system unit for mount which consists of antenna amplifier for mount which has with the control circuit which carries out min of the cross modulation output by the fanout of arbitration, carries out intussusception of the control output from this control circuit to a core wire, has the high-frequency amplifier and attenuator which are controlled by that cause, and does not have an external-control line, and a reception set.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] About FM receiving set for mount, this invention has many FM and TV stations, and relates to FM receiving set which maintains a good receive state in the strong electric-field area where an intermodulation and cross modulation tend to happen.

[0002]

[Description of the Prior Art] Drawing 7 shows association with the conventional antenna amplifier and the body of a reception set. As conventionally shown in drawing 8, although this kind of antenna amplifier equipment was not itself equipped with AGC equipment but carried out AGC control in the body side, when a very big strong input active jamming signal entered, it became out of control. Moreover, as shown in drawing 9, in what is itself equipped with AGC equipment, a certain amount of strong input control is made.

[0003]

[Problem(s) to be Solved by the Invention] However, with the above-mentioned conventional antenna amplifier equipment, when a strong input active jamming signal had AGC equipment build in RF amplifier 12 in the place of a broadband from center frequency, it operated to the linear, and when the signal of choice be still weaker, the

signal level fell, it became the signal-to-noise ratio which be hard to distinguish practically, and there be a problem that good reception could not be performed.

[0004] This invention solves such a conventional problem and offers outstanding FM receiving system unit for mount whose good FM reception is attained also about the location where field strength is strong.

[0005]

[Means for Solving the Problem] This invention supplies the control output which produces the optimal cross modulation output as the AGC input and RF attenuator control input by the side of antenna amplifier by the fanout of arbitration which consists of two input values of the RF-AGC output circuit which is installed in the body side of a reception set, and which detects field strength comparatively in a broadband, and the IF-AGC output circuit which detects field strength comparatively in a narrow-band, in order to attain the above-mentioned object.

[0006]

[Function] Therefore, according to this invention, the control output by the side of the body of a reception set which carries out optimal cross modulation can be used, and a good receiving property is acquired without using an AGC operation of the internal closed loop of antenna amplifier.

[0007]

[Example] The block diagram by the side of the body of a reception set concerning this invention is shown in drawing 1 . It is amplified by RF amplifier 21 of the dual gate FET configuration, and it is the output and the MIX (mixing) section 23 from the OSC (local dispatch) section 22, and is mixed, and the input RF (high frequency) signal amplified from antenna amplifier is changed into IF (intermediate frequency) signal. It is inputted into the IF amplifier / detection section 24 which has limiter ability after an appropriate time, for example, it is changed into a composite signal by mulberry DORACHA detection etc., is added to the MPX (multiplexer) demodulator circuit 25 the back, and separates into a right-and-left channel. Through AF (audio frequency) signal amplifier section 26, power amplification of this right-and-left channel signal is carried out, it drives an external speaker 31, and makes it a voice output.

[0008] Now, the output A detected as an electrical potential difference which changes according to input RF signal level in the MIX section 23 that the field strength of a broadband (an active jamming signal is generally also included) should be detected is inputted into RF attenuator section 11 in antenna amplifier, and the control circuit section 27 for controlling the signal of the RF amplifier section 12. On the other hand, that the field strength level of a narrow-band (generally signal chisel of choice) should be detected, when IF signal level of an IF amplifier / detection section 24 carries out AM detection of the internal amplifier, it is similarly inputted into the control circuit section 27 as an output B obtained. In the control circuit section 27 which was able to apply two inputs A and B, based on such level, the optimal electrical potential difference is judged to an intermodulation and a cross modulation property. and the output C to control is sent out to the RF-ATT section 11 and the RF amplifier section 12 inside antenna amplifier.

[0009] Next, actuation of a control circuit is explained to a detail. Drawing 2 is the property of A and B output to the signal input voltage of choice. Drawing 3 shows the field strength level detection output characteristics of A as broadband level at the time of shifting the frequency of the input voltage and performing it from received center

frequency, and B as narrow-band level, when it is made for the signal input voltage of choice to be added enough (for example, 110dBmuV extent).

[0010] Drawing 4 is the property of a control output C over the signal input field strength of choice of the control circuit 27 of drawing 1. For example, when the midpoint of the change field of a narrow-band and Broadband AGC was set to 60dBmuV, B shows less than [ 60dBmicrovolt ] and A shows more than 60dBmicrovolt, it is judged as those with an interference level input, and has the logical function to which the output characteristics of C are changed like a broken line in analog. (at the time [ Example A ] of 90dBmuV input) Drawing 5 shows the actuation output characteristics of the RF attenuator 11 with built-in antenna amplifier through the antenna by the control circuit 27, and a feeder 2 similarly. For example, since it becomes less than [ 5.5V ] to the output of 80 or more dBmuV, the attenuator 11 with built-in antenna amplifier operates, and an excessive input is protected from this electrical potential difference.

[0011] The example of \*\*\*\*\* antenna amplifier is shown in this invention at drawing 6. The input signal from an antenna 1 passes along RF attenuator which consists of pin diode D1 switching transistor Q1, and is the RF magnification FET. After going into Q2 and being amplified, it outputs to the terminal of three. In addition, as for 4, a power supply terminal, Q3, and Q4 are the magnification transistors of the AM section. 5 is a combination cable with the body of a reception set. As an example by this invention, the gate of Q1 turns [ C output of the control circuit 27 of the body of a reception set of drawing 1 / \*\* ] on by \*\*\*\*\* in the output terminal 3 of drawing 6 through a combination cable 5, D1 flows, and a strong input signal is attenuated. Moreover, since the 2nd gate of Q2 is controlled, the best cross modulation property can be acquired.

[0012] Furthermore, the effectiveness of wire saving is acquired, without there being no addition of a new line and making the difficulty at the time of car harness attachment increase, since the combination cable with the body of a reception set is used as a control cable.

[0013]

[Effect of the Invention] Since this invention can always control continuously the amount of RF attenuators in antenna amplifier, internal magnification gain, and the RF amplifier gain in a reception set the optimal according to the size of the signal field strength of choice, and active jamming signal field strength more clearly than the above-mentioned example Compared with the combination of the independent AGC control and the body of a reception set in the conventional antenna amplifier, it is hard coming to win popularity cross modulation and intermodulation active jamming, and there are many FM stations and TV stations and good FM reception of them is attained also about the location where field strength is strong.

[0014] Moreover, since antenna amplifier is controlled using a combination cable with the body of a reception set, the effectiveness of wire saving is also size.

[Translation done.]

TECHNICAL FIELD



[Industrial Application] About FM receiving set for mount, this invention has many FM and TV stations, and relates to FM receiving set which maintains a good receive state in the strong electric-field area where an intermodulation and cross modulation tend to happen.

[Translation done.]

## PRIOR ART

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## EFFECT OF THE INVENTION

[Effect of the Invention] Since this invention can always control continuously the amount of RF attenuators in antenna amplifier, internal magnification gain, and the RF amplifier gain in a reception set the optimal according to the size of the signal field strength of choice, and active jamming signal field strength more clearly than the above-mentioned example, Compared with the combination of the independent AGC control and the body of a reception set in the conventional antenna amplifier, it is hard coming to win popularity cross modulation and intermodulation active jamming, and there are many FM stations and TV stations and good FM reception of them is attained also about the location where field strength is strong.

[0014] Moreover, since antenna amplifier is controlled using a combination cable with the body of a reception set, the effectiveness of wire saving is also size.

[ Translation done.]

## TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, with the above-mentioned conventional antenna amplifier equipment, when a strong input active jamming signal had AGC equipment build in RF amplifier 12 in the place of a broadband from center frequency, it operated to the linear, and when the signal of choice be still weaker, the signal level fell, it became the signal-to-noise ratio which be hard to distinguish practically, and there be a problem that good reception could not be performed. [0004] This invention solves such a conventional problem and offers outstanding FM receiving system unit for mount whose good FM reception is attained also about the location where field strength is strong.

[Translation done.]

## MEANS

[Means for Solving the Problem] This invention supplies the control output which produces the optimal cross modulation output as the AGC input and RF attenuator control input by the side of antenna amplifier by the fanout of arbitration which consists of two input values of the RF-AGC output circuit which is installed in the body side of a reception set, and which detects field strength comparatively in a broadband, and the IF-AGC output circuit which detects field strength comparatively in a narrow-band, in order to attain the above-mentioned object.

[Translation done.]

## OPERATION

[Function] Therefore, according to this invention, the control output by the side of the body of a reception set which carries out optimal cross modulation can be used, and a good receiving property is acquired without using an AGC operation of the internal closed loop of antenna amplifier.

[Translation done.]

## EXAMPLE

[Example] The block diagram by the side of the body of a reception set concerning this invention is shown in drawing 1. It is amplified by RF amplifier 21 of the dual gate FET configuration, and it is the output and the MIX (mixing) section 23 from the OSC (local

dispatch) section 22, and is mixed, and the input RF (high frequency) signal amplified from antenna amplifier is changed into IF (intermediate frequency) signal. It is inputted into the IF amplifier / detection section 24 which has limiter ability after an appropriate time, for example, it is changed into a composite signal by mulberry DORACHA detection etc., is added to the MPX (multiplexer) demodulator circuit 25 the back, and separates into a right-and-left channel. Through AF (audio frequency) signal amplifier section 26, power amplification of this right-and-left channel signal is carried out, it drives an external speaker 31, and makes it a voice output.

[0008] Now, the output A detected as an electrical potential difference which changes according to input RF signal level in the MIX section 23 that the field strength of a broadband (an active jamming signal is generally also included) should be detected is inputted into RF attenuator section 11 in antenna amplifier, and the control circuit section 27 for controlling the signal of the RF amplifier section 12. On the other hand, that the field strength level of a narrow-band (generally signal chisel of choice) should be detected, when IF signal level of an IF amplifier / detection section 24 carries out AM detection of the internal amplifier, it is similarly inputted into the control circuit section 27 as an output B obtained. In the control circuit section 27 which was able to apply two inputs A and B, based on such level, the optimal electrical potential difference is judged to an intermodulation and a cross modulation property, and the output C to control is sent out to the RF-ATT section 11 and the RF amplifier section 12 inside antenna amplifier.

[0009] Next, actuation of a control circuit is explained to a detail. Drawing 2 is the property of A and B output to the signal input voltage of choice. Drawing 3 shows the field strength level detection output characteristics of A as broadband level at the time of shifting the frequency of the input voltage and performing it from received center frequency, and B as narrow-band level, when it is made for the signal input voltage of choice to be added enough (for example, 110dBmuV extent).

[0010] Drawing 4 is the property of a control output C over the signal input field strength of choice of the control circuit 27 of drawing 1. For example, when the midpoint of the change field of a narrow-band and Broadband AGC was set to 60dBmuV, B shows less than [ 60dBmicrovolt ] and A shows more than 60dBmicrovolt, it is judged as those with an interference level input, and has the logical function to which the output characteristics of C are changed like a broken line in analog. (at the time [ Example A ] of 90dBmuV input) Drawing 5 shows the actuation output characteristics of the RF attenuator 11 with built-in antenna amplifier through the antenna by the control circuit 27, and a feeder 2 similarly. For example, since it becomes less than [ 5.5V ] to the output of 80 or more dBmuV, the attenuator 11 with built-in antenna amplifier operates, and an excessive input is protected from this electrical potential difference.

[0011] The example of \*\*\*\*\* antenna amplifier is shown in this invention at drawing 6. The input signal from an antenna 1 passes along RF attenuator which consists of pin diode D1 switching transistor Q1, and is the RF magnification FET. After going into Q2 and being amplified, it outputs to the terminal of three. In addition, as for 4, a power supply terminal, Q3, and Q4 are the magnification transistors of the AM section. 5 is a combination cable with the body of a reception set. As an example by this invention, the gate of Q1 turns [ C output of the control circuit 27 of the body of a reception set of drawing 1 / \*\* ] on by \*\*\*\*\* in the output terminal 3 of drawing 6 through a combination cable 5, D1 flows, and a strong input signal is attenuated. Moreover, since

the 2nd gate of Q2 is controlled, the best cross modulation property can be acquired.  
[0012] Furthermore, the effectiveness of wire saving is acquired, without there being no addition of a new line and making the difficulty at the time of car harness attachment increase, since the combination cable with the body of a reception set is used as a control cable.

[Translation done.]

## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The block diagram of FM receiving system unit for mount in one example of this invention

[Drawing 2] The signal input voltage pair broadband of choice of this equipment, narrow-band control output characteristics

[Drawing 3] The deviation pair broadband from the signal center frequency of choice of this equipment, a narrow-band control output voltage property

[Drawing 4] RF amplifier control output characteristics when making signal input voltage pair active jamming signal input voltage of choice of this equipment into a parameter

[Drawing 5] The RF-ATT control characteristic of this equipment

[Drawing 6] One example of the antenna amplifier of this equipment

[Drawing 7] Joint drawing of the conventional antenna amplifier and the body of a reception set

[Drawing 8] The circuit diagram of the conventional antenna amplifier

[Drawing 9] The AGC built-in circuit diagram of the conventional antenna amplifier

[Description of Notations]

11 FR-ATT (Attenuator) Section

12 FR Amplifier Section

21 FR Amplifier

22 The OSC (Local Dispatch) Section

23 The MIX (Mixing) Section

24 IF Amplifier / Detection Section

27 Control Circuit

[Translation done.]